

***Saskatchewan Environment Summary Report:  
Hanson Lake Fish Consumption***

***August 2007***



***Saskatchewan Environment  
Industrial, Uranium and Hardrock Mining***



## Introduction and Background

Western Nuclear Mines Inc. operated a lead-copper-zinc mine on the Southwest shore of Bertrum Bay, Hanson Lake from 1966 to 1969. The site is located approximately 80 km. west of Creighton, Saskatchewan and is accessed from Highway 106 via eight km of maintained gravel road (Figure 1). At the time of the mine's closure, the headframe, mill and fine ore storage buildings were removed and the shaft and vent raise were capped with reinforced concrete. The site has been subject to numerous investigations and small-scale rehabilitation campaigns to remove debris, public safety hazards and to minimize environmental concerns.

Under provincial legislation the area has been designated as a Recreation Site, with campers and tourists using the remaining concrete foundations as campsites.

In July of 2000, Saskatchewan Environment initiated a three-year Abandoned Mines Assessment Program (Saskatchewan Environment, 2001). This program set out to identify abandoned mine sites of concern by determining whether these sites could threaten public health, public safety or if they caused environmental impacts (Saskatchewan Environment, 2001).

The program identified the Western Nuclear mine site as a priority concern among abandoned non-uranium mines. This was due to the accessibility of the site, proximity and ecological significance to Hanson Lake and the elevated profile of the site resulting from the recreational designation.

As a result, in August 2006, SRK Consulting was commissioned by Saskatchewan Environment to conduct a site characterization and remediation plan of the abandoned Western Nuclear mine site, which involved a Human Health and Ecological Preliminary Quantitative Risk Assessment (PQRA) (Saskatchewan Environment, 2007). The PQRA identified three contaminants of potential concern (COPC) - arsenic, cadmium, and lead, associated with past mine operations at Hanson Lake. Potential health risks were associated with soil, sediment and water located throughout the site.

Until remedial work can be undertaken, Saskatchewan Environment has implemented risk management measures, including restricting public access to the entire Hanson Lake recreation site. The PQRA results and the closure of the campground have generated significant public concern regarding the safety of consuming fish caught from Hanson Lake. In response to this concern and in order to determine if the human consumption of fish tissue from Hanson Lake posed a health risk Saskatchewan Environment sampled fish taken from Hanson Lake, in the proximity of the abandoned mine site.



## **Sampling Description**

Saskatchewan Environment staff collected fish tissue samples from two separate locations on Hanson Lake, with the assistance of a local trapper in May 2007.

Sampling locations included a location immediately offshore of the recreation site and a location within Bertrum Bay near the discharge of the tailings area to Hanson Lake (Figure 2). Field measurements included, GPS locations, weight and length of each fish retained for analysis and fishing effort (duration of net set). In addition, water samples were collected at each location and field pH, conductivity and water temperature were recorded (Table1).

## **Sample Preparation**

Twenty-seven fish were retrieved from the net located offshore of the recreation site which consisted of eighteen walleye, eight whitefish and one sucker. Five walleye and five whitefish were kept for analysis. Three fish were collected from the Bertrum Bay location, which consisted of two walleye and one whitefish. All three fish caught at the Bertrum Bay location were kept for analysis.

Sample preparation included removing a suitable amount of edible tissue from each fish and separating it from the skin and bones. Samples were labelled appropriately, placed in plastic bags, stored in a cooler and frozen the next day. The samples were sent to the Saskatchewan Research Council Analytical Laboratory (SRC Analytical) for analysis.

In addition, the water samples collected from each location were labelled, stored and submitted for analysis to SRC Analytical.

## **Analysis**

SRC Analytical analysed fish tissue for traces of arsenic, cadmium, and lead along with other trace elements (see Appendix A).

Once the results were received, Saskatchewan Environment graphically compared the results to available Canadian and International contaminant limits for fish and fish products (Nauen, 1983). Data from the Cumulative Effect Monitoring Program was included as a comparison of typical chemical concentrations within whitefish tissue taken from several lakes within northern Saskatchewan.

SRC results, as well as available legal limit comparisons were forwarded to the Environmental Health Officer and the Medical Health Officer of the Mamawetan Churchill River Health Authority (MCRCHA) for further analysis. Arsenic



concentrations within the tissue of the fish taken from Hansen Lake were analysed by determining whether the consumption of Hanson Lake fish could potentially increase a person's risk of developing cancer. Cadmium and lead concentrations within the tissue of the fish taken from Hansen Lake were analysed by determining whether the consumption of consuming fish taken from Hanson Lake could potentially exceed a person's daily tolerable intake of either substance.

Water samples were also analysed for general chemistry and an ICP-Scan for metals (Appendix B).

## **Results**

Concentrations in the tissue of the fish taken from Hansen Lake were well below accepted Canadian and international limits. The concentrations found in the tissue samples of the fish taken from Hanson Lake were approximately 15 times lower for cadmium (Figure 3), nine times lower for lead (Figure 4) and 20 times lower for arsenic (Figure 5) than accepted Canadian and international limits.

The MCRRHA analysis considered a 70.7 kg adult living at Hanson Lake, who had consumed fish taken from Hanson Lake daily for an entire year. It was concluded that, under these circumstances, the consumption of fish taken from Hanson Lake would not significantly contribute to a person's daily tolerable intake of cadmium, lead or arsenic. Nor would consuming the fish contribute to average person developing cancer.

In conclusion, Saskatchewan Environment, in conjunction with the MCRRHA, has determined that fish taken from Hanson Lake are safe to consume.



## References

*An Assessment of Abandoned Mines in Northern Saskatchewan (Year 1).* Saskatchewan Environment, 2001.

*Western Nuclear Site Characterization and Remediation Plan.* Saskatchewan Environment, 2007.

Nauen, Cornelia E. *"Compilation of Legal Limits for Hazardous Substances in Fish and Fishery Products."* Food and Agriculture Organization of the United Nations, 1983.



Figure 1: Western Nuclear Mine Site and Hanson Lake Recreation Site

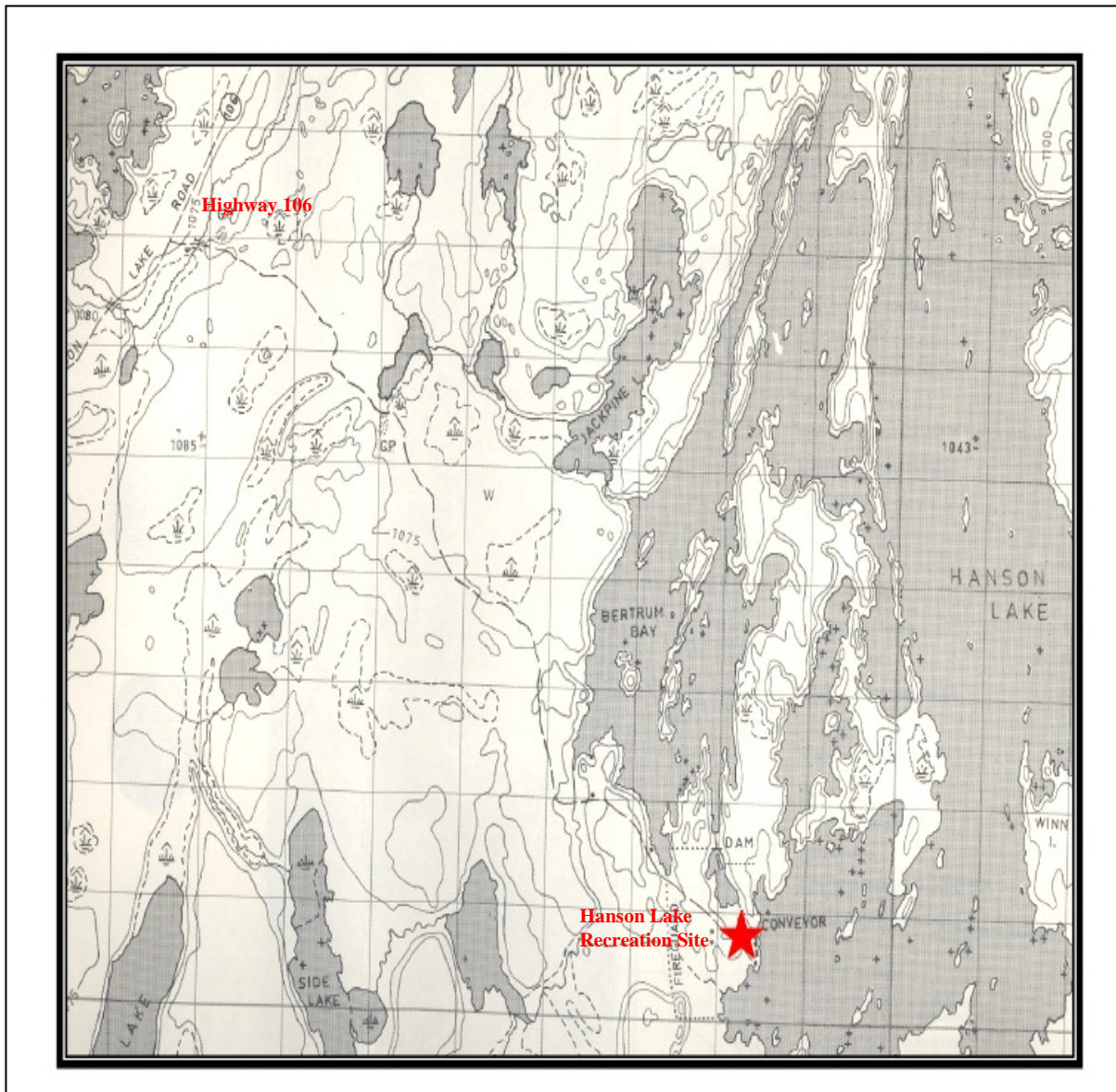






Figure 2: Hanson Lake fish sample locations

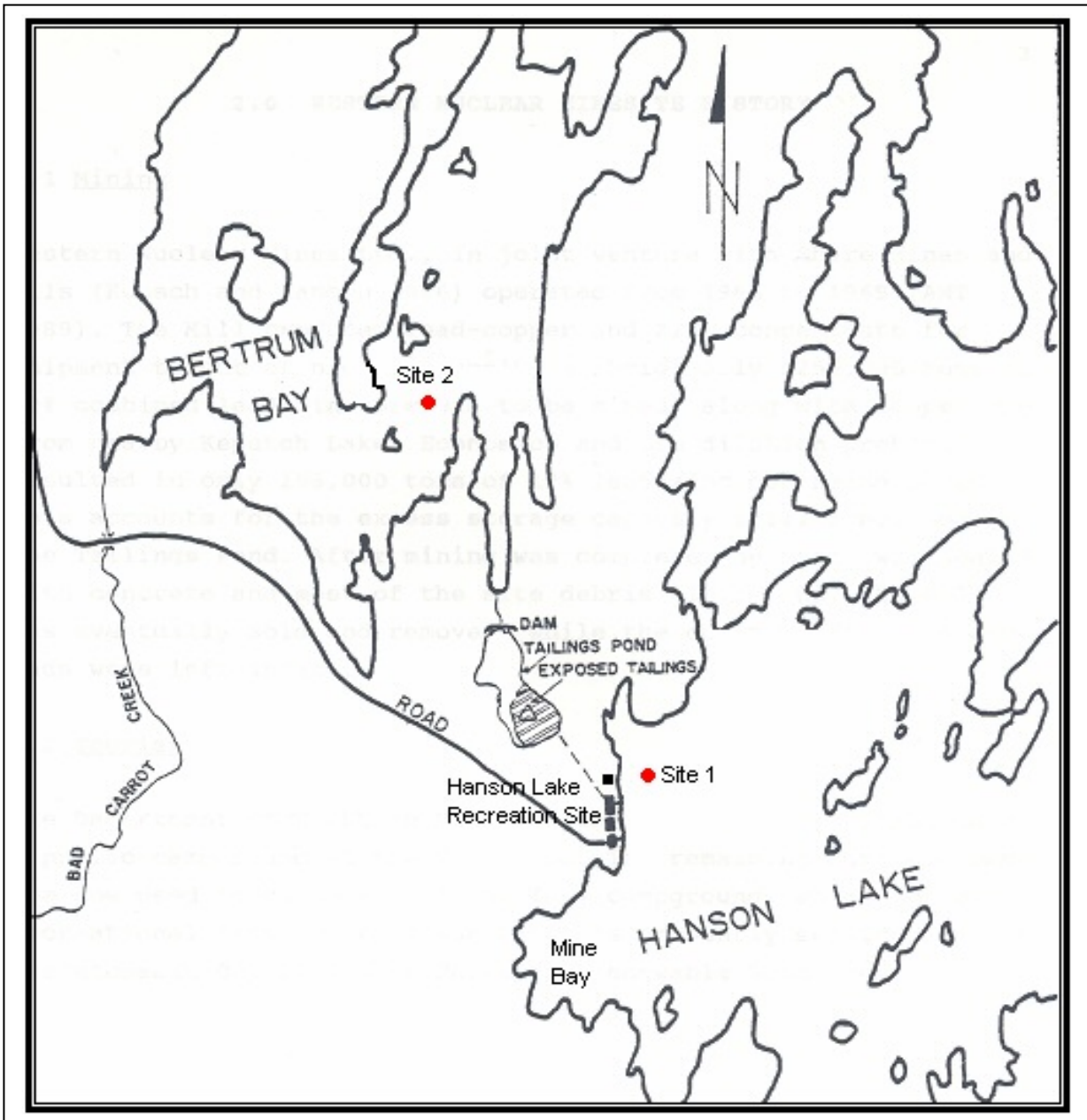




Figure 3: Hanson Lake fish tissue cadmium concentrations

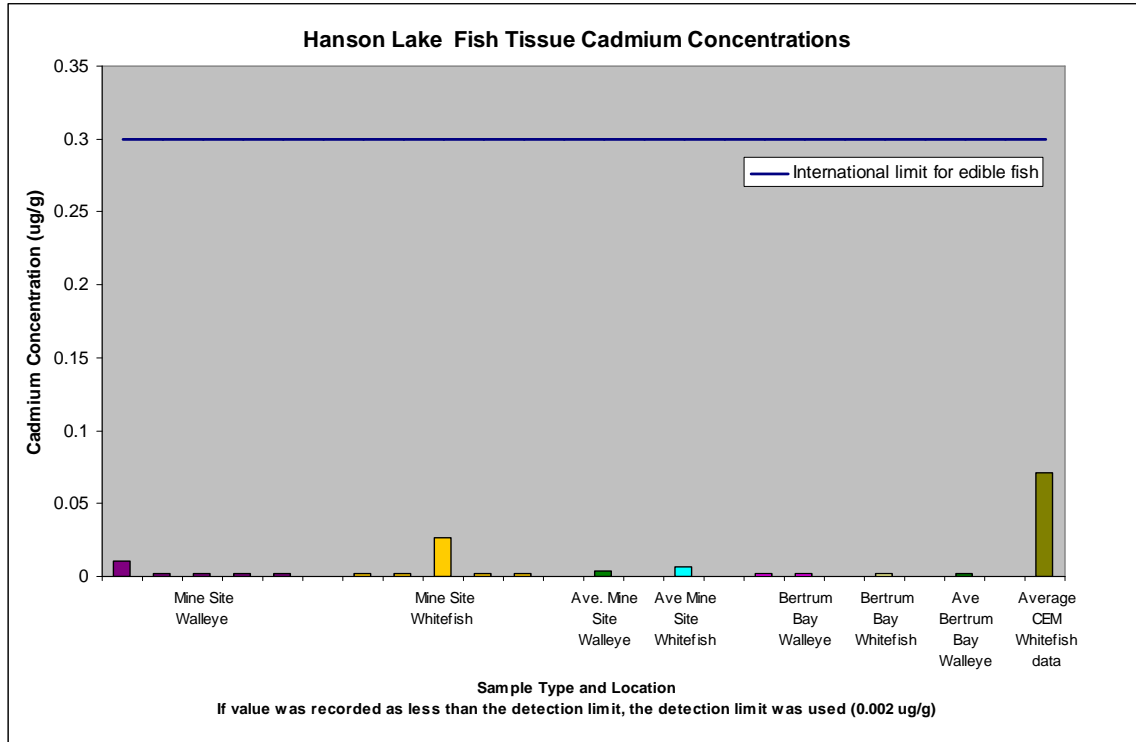


Figure 4: Hanson Lake fish tissue lead concentrations

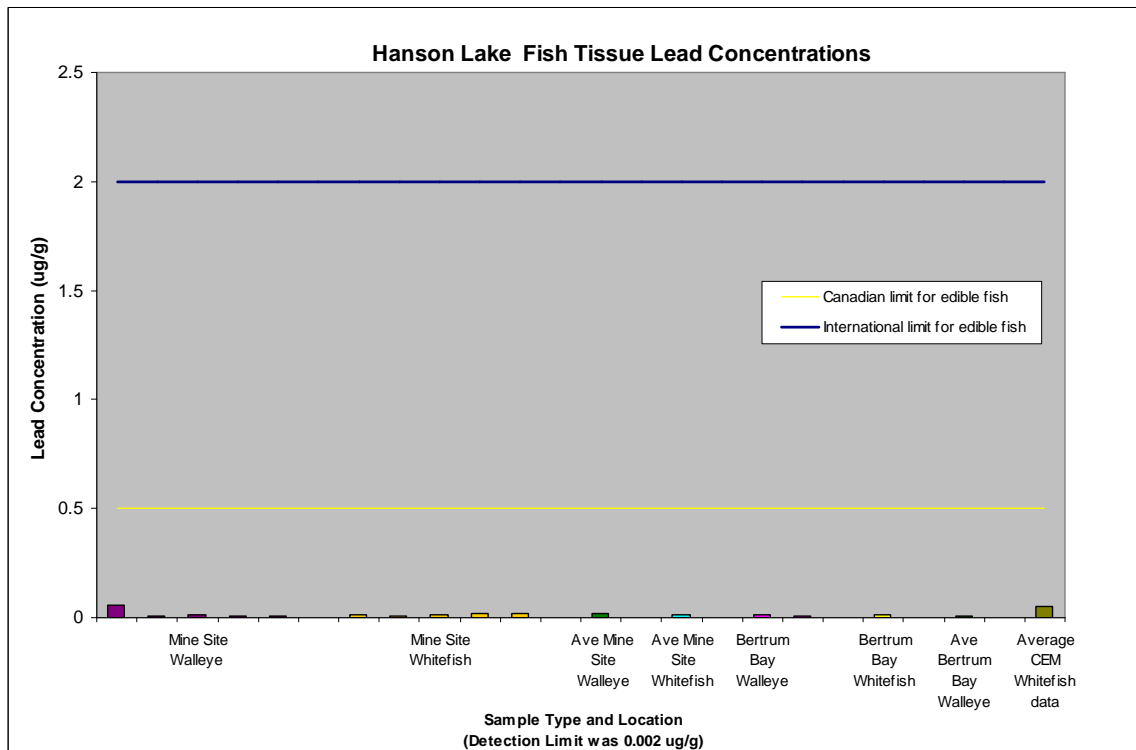






Figure 5: Hanson Lake fish tissue arsenic concentrations

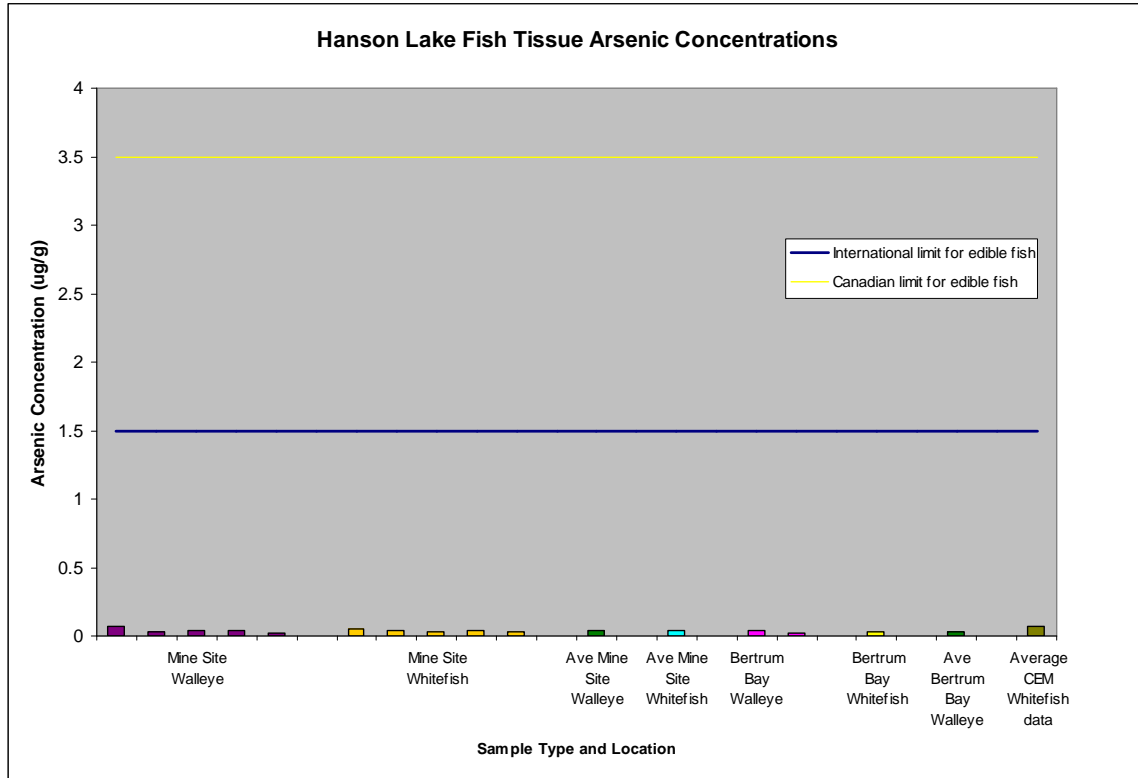




Table 1: Field data for Hanson Lake fish samples

Location	Fishing Effort (Duration of net set)	Water Characteristics	Sample Number	Fish Type	Length (cm)	Weight (lbs)
Offshore of Mine Site NAD27 13U 638608 6060845	1 hour and 55 minutes	pH: 7.94  Temperature: 10.9°C  Conductivity: 149.3µS	HL-MS-W-001	Walleye	53.0	2 lbs 8 oz
			HL-MS-W-002	Walleye	53.0	2 lbs 11 oz
			HL-MS-W-003	Walleye	54.0	3 lbs 2 oz
			HL-MS-W-004	Walleye	54.5	3 lbs 8 oz
			HL-MS-W-005	Walleye	55.0	3 lbs 10 oz
			HL-MS-WF-001	White Fish	52.0	2 lbs 15 oz
			HL-MS-WF-002	White Fish	57.0	3 lbs 7 oz
			HL-MS-WF-003	White Fish	47.0	2 lbs 4 oz
			HL-MS-WF-004	White Fish	47.0	2 lbs 2 oz
			HL-MS-WF-005	White Fish	53.0	2 lbs 15 oz
			Bertrum Bay NAD27 13U 637674 6062524	3 hours and 57 minutes	pH: 7.27  Temperature: 10.1°C  Conductivity: 144.4µS	HL-BB-W-001
HL-BB-W-002	Walleye	41.5				1 lb 12 oz
HL-BB-WF-001	White Fish	37.0				1 lb 10 oz



Appendix A: SRC Analytical Fish Data Reports



Appendix B: SRC Analytical Water Chemistry Reports